



Treatment and outcomes of horses with acute synovitis in the racing season: a 167 case series study

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ABSTRACT

Among the causes of lameness in horses, those of arthrogenic origin, especially synovitis, which can progress to advanced joint damages, such as osteoarthritis, are of importance in clinical practice. In this study, we aimed to evaluate the early diagnosis, treatment, and treatment outcomes of acute synovitis, which occur frequently in English and Arabian horses during the racing season. A total of 167 joints of 126 horses (39 English and 87 Arabian Thoroughbred) aged 2-4 years diagnosed with acute synovitis were evaluated using clinical, radiographic, and ultrasonographic examinations. The treatment protocol of horses consisted of cold hydrotherapy and light pressure bandage initially, followed by rest for 10 days and controlled walking only, a single dose of phenylbutazone, and intra-articular corticosteroid and hyaluronic acid injection. Although functional improvement was observed in all the horses following this treatment, subsequent relapses occurred in 22 cases. Consequently, it is important to comply with this treatment program and plan the treatment of acute synovitis in the early period. Controlled gaits, rather than absolute immobility, increase the success of treatment, especially in horses at rest. In addition, it is important to ensure that the relevant joint is not overburdened after the rest period in order to avoid relapses.

Keywords

Joint, Osteoarthritis, Racehorse, Synovitis

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Abbreviations

AAEP: American Association of Equine Practitioners
MHz: Megahertz

Introduction

Similar to many other species, the joints of horses have a structure that absorbs concussion and allows limb movement. The two ends of the bone are enclosed in a fibrous capsule that helps provide stability, and stabilization is achieved by attaching the collateral ligaments to the sides of each of the bones in the joint capsule. The interior of the joint capsule consists of synovial membranes that cover its sides. The synovial membranes produce "synovia" to allow frictionless movement of the joint and are an integral part of the joint. In addition to its lubricating feature, synovial fluid supplies nutrients to the joint and removes waste products from the joint [1, 2, 3]. Moreover, the synovial joints are at great risk because they are the most active joints in a horse's body. They consist of two bone ends covered with the articular cartilage, which is so smooth and flexible, allowing frictionless movement of the joint if properly lubricated [2, 4].

The joints are exposed to stress, pressure, and cyclical trauma daily, especially in racehorses, and the greatest stress is experienced when the horse stops after moving or galloping at high speeds. Wear and tear that can cause joint problems is often caused by such stress and cyclical trauma [2]. Wear and tear usually occurs as a result of the inflammation of the synovial membranes (synovitis), which are very important and contribute to the frictionless movement of the joint [5].

Synovitis is very common in racehorses, and results in serious complications, including osteoarthritis, if not treated effectively [6, 7-9]. Therefore, early diagnosis and treatment of synovitis before the occurrence of any complications that lead to joint damage are important. In most cases, symptomatic treatment is performed with cold hydrotherapy or agents, such as nonsteroidal anti-inflammatory agents. Consequently, the overlooked synovitis progresses further [10, 11].

Therefore, in this study, we aimed to evaluate the early treatment and treatment outcomes of synovitis, which frequently occurs in racehorses. We emphasized the importance of rest and a controlled exercise program together with early treatment for synovitis in horses.

Results

The horses included in the study consisted of only Arabian ($n = 87$, 69.04%) and English Thoroughbred ($n = 39$, 30.95%) horses. The included animals were young and aged 2-4 years. English horses were 2-4 years old, while Arabian horses were 3 years old. The gender distribution of the horses is shown in Table 1.

During clinical examination, a healthy posture

was observed in some horses when they were inspected in the standing position, whereas in the horses with a high lameness score, the swelling was more pronounced, and the foot touched the ground with the tip of the toe. Similarly, it was observed that these horses did not equally distribute their body weight on their four legs.

Effusion in the affected joints (Figure 1) caused swelling only in certain areas in cases with low effusion scores, whereas in cases with high effusion scores, the joint was entirely swollen and the joint capsule was tense. The effusion scores are presented in Table 2. Mild, moderate, and severe increases in temperature and tenderness were found in the palpation of the joint area. While pain during flexion was less in horses with less inflammatory symptoms and a less degree of effusion, it was quite severe in horses with severe effusion and a high degree of inflammation. The results obtained in the flexion test are presented in Table 2.

All the horses showed a varying severity of lameness and were graded according to the American Association of Equine Practitioners (AAEP) lameness



Figure 1. A. Swelling appearance due to effusion of the carpal joint. B. Swelling of the tarsal joint due to effusion. C. The gush of synovial fluid during puncture due to loss of viscosity of the synovial fluid. D. Change in aspirated synovial fluid color and loss of viscosity are shown.

Evaluation of acute synovitis in racehorses

score. The data are summarized in Table 2. In the physical examination of the synovial fluid, the color was orange to transparent and had lost its viscosity to a considerable extent (Figure 1). Furthermore, viscosity loss was observed to be much higher, especially in cases with an effusion score of 3-4.

No comparison was made between Arabian and English horses in terms of joint location. It was observed that the bilateral metacarpophalangeal joint was affected in six horses, cross metacarpophalangeal and tarsocrural joints in one horse, distal interphalangeal and metacarpophalangeal joints of the same extremity in one horse, and one tarsocrural joint, one distal interphalangeal joint, and one metacarpophalangeal joint in two horses. It was determined that the most commonly affected joints were the metacarpophalangeal joint of the anterior extremity ($n = 86$, 51.49%) and the tarsal joint of the posterior extrem-

ity ($n = 27$, 16.16%). Synovitis was most common in the tarsocrural joint in the tarsal joint. Effusion was observed in the tarsometatarsal joint in only one case. Other joints with acute synovitis apart from the abovementioned joints are shown in Table 2.

During the post-treatment follow-up of the horses (Figure 3), the symptoms of local inflammation were observed to disappear within 3-4 days. At the end of the 10-day resting period, all the horses showed a functional improvement in the clinical and lameness examinations, as well as the clinical score (i.e., effusion, lameness, pain score in flexion). However, 21 horses (16.66%) had a relapse of synovitis in the same joint and 29 (23.01%) in different joints. It is important to note that these relapse cases did not comply with the recommended resting schedule and quickly resumed intense exercises after the treatment was completed.



Figure 2. Radiographs of different cases; A. Synovitis of the tarsocrural joint in a 4-year-old English Thoroughbred. B. Synovitis of the metacarpophalangeal joint in a 4-year-old English Thoroughbred. C. Synovitis of the carpal joint in a 3-year-old Arabian Thoroughbred. White arrow: Tension and swelling in the joint capsule with the developing effusion.



Figure 3. Post-treatment radiographic images of the cases given in Figure 1.

Evaluation of acute synovitis in racehorses

Table 1.
The affected joints, effusion score, flexion pain score, and lameness score of English and Arabian horses evaluated in the racing season

Horse		The affected joint					Effusion score					Pain score in flexion				Lameness score					
		M1	M2	D	T	C	0	1	2	3	4	0	1	2	3	0	1	2	3	4	5
Arabian horses	Y: 87 (50 F, 37 M)	53	15	5	18	16		3	56	43	5		7	34	66		4	25	30	43	5
English horses	Y: 39 (19 F, 20 M)	33	6	5	9	7		4	27	28	1		4	24	32		2	14	11	11	1
Total	126 (69 F, 57 M)	86	21	10	27	23		7	83	71	6		11	58	98		6	39	41	54	6

Y: Young (0-4 years), F: Female, M: Male.
The affected joint: M1: Metacarpophalangeal joint, M2: Metatarsophalangeal joint, D: Distal interphalangeal joint, T: Tarsal joint, C: Carpal joint
Effusion score: 0: No effusion, 1: Mild, 2: Moderate, 3: Severe effusion, 4: Severe swelling of the joint region
Pain score in flexion: 0: No pain, 1: Mild pain, 2: Moderate pain, 3: Severe pain
Lameness score: 0: Lameness not perceptible under any circumstances. 1: Lameness is difficult to observe and is not consistently apparent, regardless of circumstances (e.g. under saddle, circling, inclines, hard surface, etc.). 2: Lameness is difficult to observe at a walk or when trotting in a straight line but consistently apparent under certain circumstances (e.g. weight-carrying, circling, inclines, hard surface, etc.). 3: Lameness is consistently observable at a trot under all circumstances. 4: Lameness is obvious at a walk. 5: Lameness produces minimal weight bearing in motion and/or at rest or a complete inability to move.

Discussion

Joint pain is one of the causes of lameness in performance horses [13]. Traumatic arthritis, which is one of the common joint diseases in horses, includes a combination of various pathological and clinical symptoms. Acute arthritis that develops after experiencing a single trauma or repeated traumas entails 1) synovitis (inflammation of the synovial membrane), 2) capsulitis (inflammation of the joint capsule), 3) sprains (injury of certain ligaments), 4) intra-articular fractures, and 5) meniscal tears (femorotibial joints). The presence of one of these conditions alone can also lead to osteoarthritis progression [14, 15]. Therefore, early diagnosis and effective treatment of acute synovitis are very important for preventing permanent damage to the joint [15, 16]. The present study aimed to emphasize the importance of rest and controlled exercise together with the early treatment of common synovitis in racehorses.

Two basic pathobiological processes should be considered in the case of a traumatically injured joint. The first of these is the inflammation of the synovial membrane and joint capsule (synovitis and capsulitis) and the other is biochemical damage to the articular cartilage and bones [4, 14]. In the case of acute synovitis and capsulitis, some enzymes and cytokines are released (e.g., matrix metalloproteinases, aggrecanases, prostaglandins, free radicals, tumor necrosis factor-alpha, and interleukin-1), which lead to synovial membrane inflammation, important clinical symptoms, and synovial structure disruption, which in turn result in effusion [3, 6, 8, 14, 17, 18]. Minimizing joint damage and stopping the progression of acute

inflammations of the synovial membrane and joint capsule are important [13, 15]. Otherwise, serious complications, including articular cartilage lesions and osteoarthritis may occur [8, 13, 18]. The horse owners or caregivers were informed about the importance of early treatment, adequate rest, and a gradual exercise program in all horses included in this study. However, recurrence (n = 21, 16.16%) was observed in horses that did not comply with adequate rest and a gradual exercise program. Recurrence and such disruptions in the treatment process will predispose to osteoarthritis by creating disorders in the anatomical structures of the joint in the following periods.

The clinical approach towards treating a horse with lameness or joint swelling is important and requires a good clinical examination to determine whether or not the underlying problem is primarily in the soft tissues. In cases where synovitis is suspected, radiographs are often used to evaluate the joint for determining the presence of osteochondral damage. In addition, further radiographs should be performed to identify changes suggestive of further structural damage in chronic cases that do not respond to treatment. Moreover, synovial fluid analysis (at least physical examination) is always useful [14, 16, 19]. Colour and viscosity assessments can be performed in the synovial fluids aspirated under aseptic conditions. Synovial fluid analysis should be completed to rule out infective arthritis, especially in severe lameness associated with synovial effusion [3, 16]. In this study, after a detailed medical history was recorded for each horse presenting with the

complaint of lameness and swelling in the joint area, the location of the lesion was determined according to the findings during inspection and palpation. Furthermore, radiographs were obtained and evaluated for the presence of other possible damages. In addition, an ultrasonographic examination was performed to determine the surrounding soft tissue damage. Damage to the bone tissue or other joint tissues, such as the surrounding capsule and ligament, was evaluated. Radiographic and ultrasonographic examinations were found to be very useful in distinguishing cases with only acute synovitis from other cases. The physical examination of the synovial fluid revealed that all the horses had varying degrees of viscosity loss. Synovial viscosity loss was more severe in horses with severe effusion, and pain during flexion and lameness was more severe in these horses. This has been attributed to pain and effusion due to inflammation. Therefore, treatment aims to reduce effusion and relieve pain along with management of inflammation. In the treatment method described in this study, cold hydrotherapy application and aspiration of the excess fluid in the joint were performed, followed by intra-articular corticosteroid administration. Next, the joint was protected with an animalintex bandage. When the signs of inflammation subsided, hyaluronic acid was injected into the joint. This treatment protocol was complementary and highly effective in cases of acute synovitis. However, the occurrence of relapses was found to be significant in horses that did not take adequate rest after the treatment or started high-intensity training within a short time post-treatment. The data obtained from this study showed that initiating a subsequent training process after the treatment protocol would be beneficial when sufficient time is passed.

In the treatment of synovitis in horses, nonsteroidal anti-inflammatory agents, cold hydrotherapy, and hyaluronic acid are applied [10, 11, 15]. Grauw et al. [7] emphasized that phenylbutazone as a nonsteroidal anti-inflammatory agent is clinically effective in cases with acute synovitis and does not limit cartilage catabolism, but can temporarily reduce collagen anabolism. McIlwraith et al. [20] reported at the 17th Kentucky Equine Research Nutrition Conference that cold hydrotherapy delays inflammatory processes, such as exudation and diapedesis in acute joint injuries and is effective in reducing edema. In this study, a single dose of slow intravenous phenylbutazone injection was administered together with cold hydrotherapy and intra-articular corticosteroid injection, and swelling and inflammation in the joint area decreased in all cases.

In many investigations, intra-articular corticosteroids have been recommended in the treatment of acute synovitis [5, 15, 18, 21], namely betamethasone,

triamcinolone acetonide, and methylprednisolone acetate. It has been reported that triamcinolone acetonide increases the concentration of hyaluronic acid and glycosaminoglycan in the synovial fluid and reduces total protein and inflammatory cell infiltration. Methylprednisolone is a long-acting compound compared to betamethasone and triamcinolone acetonide. However, it has been indicated to cause chondrocyte necrosis and proteoglycan loss [21]. As a result, triamcinolone acetate was preferred as the intra-articular corticosteroid in this study. McIlwraith et al. [20] emphasized that there was a significant improvement in the degree of lameness, morphological parameters of synovial fluid, synovial membrane, and articular cartilage in horses treated with triamcinolone acetate. Triamcinolone acetonide was administered to all horses included in this study and all recovered functionally.

Extremity joints of racehorses are subject to stress and cyclic trauma due to racing and intense exercise. The wear and tear that can damage the joints is often caused by such stress and cyclic trauma [2]. Wear and tear on the joint surface is usually caused by the inflammation of the synovial membranes (synovitis) [5]. Hyaluronan is a glycosaminoglycan that plays an important role in the formation of proteoglycan aggregates in articular cartilage. It is also a component of synovial fluid and indirectly contributes to the viscosity of the synovial fluid. In addition, intra-articular hyaluronan has a pain-relieving effect [12]. Niemela et al. [12] reported that a single dose of intra-articular hyaluronic acid injection significantly reduced pain scores in joint effusion and flexion and that it could be used to diminish lameness in synovitis and mild osteoarthritis. In our study, intra-articular hyaluronic acid was injected into all horses diagnosed with synovitis, and functional improvement was achieved in all of them. It was thought that the later recurrence was due to a rapid transition to rest and an intense exercise program.

Taking rest has a clear benefit in cases of acute synovitis and capsulitis. It may not be possible to provide rest to horses engaged in racing or other athletic activities and allow for a full recovery. Bandage support can also help an acutely damaged joint heal. In such cases, it has been shown that a light pressure bandage stimulates the mechanoreceptors, which may reduce the sense of pain [15]. Immobilization is important in traumas, but it is not that important if the problem is limited to synovitis/capsulitis. This is because long-term immobilization can cause muscle atrophy, adhesion formation, and articular cartilage atrophy in the joint. Passive flexion of the limbs and joints can help maintain mobility, and controlled gait exercises are recommended in most cases. In

addition, intense exercises, such as training, should be discontinued and only controlled gait exercises should be continued instead. This would maintain the movement of the joint capsule and prevent atrophic changes in the articular cartilage [5, 15]. In all horses treated in this study, a light pressure bandage was applied to the joint on the first day. After 3 days of stable rest, 7 days of controlled walks and 10 days of rest were recommended. It is an important finding that relapses occur in horses that do not fully comply with this resting schedule.

Acute synovitis often occurs in racehorses or athletic horses and progresses into articular cartilage degeneration or osteoarthritis over time due to the recurrences of trauma or stress factors [10]. Osteoarthritis mostly occurs in the middle and old ages [3]. The horses included in the current study were young horses aged 2-4 years. These horses in question will be predisposed to osteoarthritis in their later years if they are not treated appropriately and if they do not comply with adequate rest and controlled exercise programs.

In young horses, synovitis is most common in the metacarpophalangeal joint of the anterior limbs [6, 12, 14], followed by the carpal joints [6, 14]. The tarsal joint is a common etiology of posterior limb lameness in horses. The proximal intertarsal joint is associat-

ed with the tibiotarsal joint; therefore, lesions of the proximal intertarsal joint can often be observed in the tarsal joint, which is a highly mobile weight-bearing joint [22]. In this study, considering the location of the affected joints, it is noteworthy that cases of synovitis were more common in the anterior extremities, especially in the metacarpophalangeal joint (51.49%) (Table 2). This may be related to the fact that the body weight on the anterior extremity is higher and the resulting stress increases. Synovitis cases were more common especially in the tarsocrural joint (16.16%) among the joints of the posterior extremity, which can be attributed to the high mobility of this joint and the great stress experienced by that joint during movement.

In conclusion, it is important to follow the treatment schedule and plan an early treatment of acute synovitis, which often occurs in racehorses. Controlled gaits, instead of absolute immobility, increase the success of treatment in resting horses, and in order to avoid relapses, the relevant joint should not be overburdened as soon as the rest period is over. Furthermore, acute swelling in the joint area should not be considered acute synovitis, and radiographic and ultrasonographic examinations should be conducted for differential diagnosis.

Table 2.
Scorings used during clinical examination

Effusion score			Pain score in flexion		AAEP [*] lameness scale	
0	No effusion	0	No pain	0	Lameness not perceptible under any circumstances	
1	Mild effusion	1	Mild pain, i.e. the horse shows some reaction, such as moving the limb	1	Lameness is difficult to observe and is not consistently apparent, regardless of circumstances (e.g. under saddle, circling, inclines, hard surface, etc.)	
2	Moderate effusion	2	Moderate pain, i.e. the horse retracts the limb repeatedly during the 1 min flexion period	2	Lameness is difficult to observe at a walk or when trotting in a straight line but consistently apparent under certain circumstances (e.g. weight-carrying, circling, inclines, hard surface, etc.)	
3	Severe effusion			3	Lameness is consistently observable at a trot under all circumstances	
4	Severe swelling of the joint region	3	Severe pain, i.e. the flexion test cannot be properly performed	4	Lameness is obvious at a walk	
				5	Lameness produces minimal weight bearing in motion and/or at rest or a complete inability to move	

^{*}AAEP: American Association of Equine Practitioners

Materials & Methods

The study material consisted of 167 joints of 126 horses belonging to different races and genders with an age range of 2-4 years. They were brought to the Turkey Jockey Club Elazığ Horse Hospital in the 2018 racing season (April-October). Permission for the study was obtained from Dicle University Animal Experiments Ethics Committee with the document numbered E-35582840-604.01.01-133490. An orthopedic examination was performed after a thorough medical history was recorded for each horse that presented with complaints of swelling in the joint area (joints are given in Table 2) and lameness. Temperature, crepitation, and tension in the joint capsule were evaluated by palpating the swollen joint. In addition, horses were observed during normal gait and trot movements. Radiographic and ultrasonographic examinations (10-18 MHz probe) were performed in various aspects (dorsopalmar, dorsoplantar, lateromedial, mediolateral, mediolateral in flexion position, dorsolateral-palmaromedial oblique, dorsomedial-palmarolateral oblique, and skyline views) to ensure that there was no damage to the bone and soft tissues in the joint area. Horses showing lesions (desmitis, tendon rupture, degenerative joint damage, fracture, dislocation, and osteochondritis dissecans) in the radiographic (Figure 2-3) and ultrasonographic examinations were not included in the study. In addition, the synovial fluid (Figure 1) was physiologically examined by puncturing the swollen joint. The leukocyte count in the synovial fluid was measured using a blood count device. Cases with particles or increased leukocyte count in the synovial fluid were excluded from the study. Moreover, effusion scoring, flexion pain scoring, and American Association of Equine Practitioners (AAEP) lameness scoring [12] were performed for all horses included in the study (Table 2). Relapses in the same joint were not evaluated within the scope of these scorings. After performing all the examinations, cold hydrotherapy and a light pressure bandage were applied initially, and a 10-day resting period was advised with daily controlled gaits during this resting period in the horses diagnosed with synovitis. Each horse received phenylbutazone (Equi-Butazon[®], Provect, Turkey) as a slow intravenous infusion single dose of 4 mg/kg and was bandaged with a poultice pad (Animalintex[®] poultice dressing, Robinson Healthcare, England) for 2 days. In addition, intra-articular triamcinolone acetonide (Sinakort A[®], 40 mg, İbrahim Etem, Turkey) was administered to each relevant joint. The patients were monitored daily and intra-articular hyaluronic acid (Regenflex[®], 2 ml, Intrafarma, Italy) was injected when the severity of inflammation (temperature and pain) in the joint area declined. The horses were monitored through routine follow-ups until functional recovery was achieved.

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Competing Interests

The authors declare that there is no conflict of interest.

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